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<p>(21) International Application Number: PCT/GB98/02832</p> <p>(22) International Filing Date: 17 September 1998 (17.09.98)</p> <p>(30) Priority Data: 9721207.0 8 October 1997 (08.10.97) GB 9805009.9 9 March 1998 (09.03.98) GB</p> <p>(71) Applicant (for all designated States except US): SCAPA GROUP PLC [GB/GB]; Oakfield House, 93 Preston New Road, Blackburn, Lancashire BB2 6AY (GB).</p> <p>(72) Inventor; and</p> <p>(75) Inventor/Applicant (for US only): ALLUM, Andrew [GB/GB]; 50 Crossbarn Grove, Darwen, Lancashire BB3 2BA (GB).</p> <p>(74) Agents: MIDDLEMIST, Ian et al.; Wilson Gunn M'Caw, 41-51 Royal Exchange, Cross Street, Manchester M2 7BD (GB).</p>		<p>(81) Designated States: AU, CA, JP, US, European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE).</p> <p>Published <i>With international search report.</i></p>
<p>(54) Title: IMPROVED INDUSTRIAL FABRICS</p> <p>(57) Abstract</p> <p>An industrial fabric, suitable for use as papermachine clothing, belting or a filter cloth, comprises a permeable support (11) carrying a layer of sintered polymeric particles (15), and a layer (16) providing a smooth surface coating. The surface of layer (16) has an R_zD value equal to or greater than 50.</p>		

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IMPROVED INDUSTRIAL FABRICS

This invention relates to industrial fabrics having improved surface characteristics.

The term "industrial fabrics" is intended to include all forms of papermachine clothing, filter cloths and filter belts, conveyer belts and roll covers.

It is known, e.g. from GB 2,283,926 to form a filter from partially fused particles, which may be polymeric or alternatively metal. The partially fused particles may be located on a base structure, or a reinforcing structure may be embedded within the partially fused particles. WO 95/21285 discloses a method of polymer coating an industrial fabric by urging a release sheet coated with a polymer film against a textile substrate, curing the polymer in contact with the substrate, and removing the release sheet to leave the polymer on the substrate. The polymer coating is preferably reticular comprising a network of two dimensional pores, thus providing permeability.

Press felts for papermachines currently in use generally comprise one or more fibrous batts, reinforced and carried by a woven or nonwoven structure, including a foraminous membrane or a spiral-link fabric. Such felts may be seamed or endless. If seamed, the seam structure, no matter how carefully designed and made, has the potential to mark the paper web,

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as does the structure of the reinforcing or carrier layer, especially if woven from yarns comprising relatively hard materials such as polyamide, and spiral link fabrics, even through the fibrous batt(s).

An object of this invention is to provide an industrial fabric, in particular for use as papermachine clothing, especially for example a press felt, extended nip press belt, transfer belt or the like, wherein the potential for marking of the paper web is further reduced beyond that obtainable by careful design and manufacture of press felts etc. as presently used.

According to the invention, an industrial fabric, as hereinbefore defined, comprises at least a paper-contacting layer comprising a layer of sintered partially fused polymeric particles, coated on the paper-contacting face with a smooth polymeric coating.

Preferably the coating surface has an R_a value greater than or equal to 50 for the surface roughness.

The sintered polymeric particle layer may be carried upon a support structure comprising a foraminous membrane, which may be reinforced by yarns or filaments within its structure extending in the machine direction and/or the cross-machine direction.

The support structure may merely carry the sintered layer, or be wholly or partially encapsulated within the sintered layer.

The support structure may alternatively be a woven or nonwoven

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fabric, or a spiral link fabric.

The sintered layer may encapsulate one or more additional textile, or membrane reinforcing layers.

The polymeric coating may be applied by any known method, including by transfer as described in WO 95/21285 mentioned above. The polymeric coating is preferably reticular, or at least porous according to some pattern, sufficiently to allow passage of water expressed e.g. from a paper web to pass through the layer into the particle layer.

The fabric, in a preferred embodiment, may comprise a porous polymer layer over a layer of sintered polymeric particles, carried in turn upon a foraminous membrane. Used as a press-felt in a papermachine, with the polymeric layer contacting the paper web, a hierarchy of pore sizes may be produced leading away from the paper, ensuring increasing void space, and that flow away from the paper web will be encouraged whilst return flow is restricted. The polymer layer provides an array of e.g. reticular micro-pores, whilst the sintered layer provides larger voids between non-contacting parts of the particles, and finally the foraminous membrane provides apertures on a millimetre scale which are considerably larger than the voids in the sintered layer.

The polymeric coating layer may be rendered porous by incorporating a blowing agent which forms bubbles in the material, which are burst in

application of the layer to provide pores passing through the layer.

In accordance with a preferred embodiment of the invention, an industrial fabric is provided, substantially as set out above, save that the polymeric coating is replaced by a layer of a nonwoven fabric. This is preferably a melt-blown, spunbond, spunbond/meltblown/spunbond laminate (SMS) or a thermally bonded nonwoven.

Preferably the nonwoven is bonded, directly or indirectly to the layer of sintered particles by heat, chemicals (e.g. solvent or adhesive) or by mechanical means such as ultrasonic welding.

The fibres of the nonwoven fabric may be of a material selected from polyolefins (such as polypropylene or polyethylene) polyester (e.g. PET, PBT, PPT, PEN, PBN) copolyesters (e.g. PCTA), polyamides (such as PA6, PA6.6, PA6.10, PA11, PA12) aramids, including meta or para-aramids; fluoropolymers (e.g. PTFE or PVDF), elastomers (such as TPU); PPS; PPO; PBO; glass, ceramics, basalt or carbon; or a blend of fibres of two or more such materials.

The fineness, basis weight and thickness of the nonwoven material forming said layer may be varied according to the intended use of the fabric. In the case of a spunbond nonwoven, the fibres may be 0.1-50 dtex and form a nonwoven with a basis weight of 10-800 g/m², and thickness of 0.1-4.0mm. Meltblowns comprise much finer diameter fibres (1-5 microns) and

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form very small pores less than 1 micron in size.

The fabric according to the invention may be used in papermaking applications, such as press felts, etc. as set out in the patent application mentioned above, but is particularly suitable for use as a filter medium.

Some embodiments of industrial fabric according to the invention will now be described by way of example, with reference to the accompanying drawings, wherein:-

Fig. 1 is a much enlarged sectional view of a fragment of a papermachine press fabric according to the invention;

Fig. 2 is an enlarged cross-section, of a second embodiment of industrial fabric according to the invention, which may for example be used as a filter fabric;

Fig. 3 is a similar view to Fig 2 of a third embodiment of industrial fabric according to the invention; and

Fig. 4 is a similar view of a filter fabric according to the invention.

Fig. 1 is a much enlarged fragmentary cross-section of a papermachine press fabric 10 according to the invention, to replace

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application of the layer to provide pores passing through the layer.

In accordance with a preferred embodiment of the invention, an industrial fabric is provided, substantially as set out above, save that the polymeric coating is replaced by a layer of a nonwoven fabric. This is preferably a melt-blown, spunbond, spunbond/meltblown/spunbond laminate (SMS) or a thermally bonded nonwoven.

Preferably the nonwoven is bonded, directly or indirectly to the layer of sintered particles by heat, chemicals (e.g. solvent or adhesive) or by mechanical means such as ultrasonic welding.

The fibres of the nonwoven fabric may be of a material selected from polyolefins (such as polypropylene or polyethylene) polyester (e.g. PET, PBT, PPT, PEN, PBN) copolyesters (e.g. PCTA), polyamides (such as PA6, PA6.6, PA6.10, PA11, PA12) aramids, including meta or para-aramids; fluoropolymers (e.g. PTFE or PVDF), elastomers (such as TPU); PPS; PPO; PBO; glass, ceramics, basalt or carbon; or a blend of fibres of two or more such materials.

The fineness, basis weight and thickness of the nonwoven material forming said layer may be varied according to the intended use of the fabric. In the case of a spunbond nonwoven, the fibres may be 0.1-50 dtex and form a nonwoven with a basis weight of 10-800 g/m², and thickness of 0.1-4.0mm. Meltblowns comprise much finer diameter fibres (1-5 microns) and

-5-

form very small pores less than 1 micron in size.

The fabric according to the invention may be used in papermaking applications, such as press felts, etc. as set out in the patent application mentioned above, but is particularly suitable for use as a filter medium.

Some embodiments of industrial fabric according to the invention will now be described by way of example, with reference to the accompanying drawings, wherein:-

Fig. 1 is a much enlarged sectional view of a fragment of a papermachine press fabric according to the invention;

Fig. 2 is an enlarged cross-section, of a second embodiment of industrial fabric according to the invention, which may for example be used as a filter fabric;

Fig. 3 is a similar view to Fig 2 of a third embodiment of industrial fabric according to the invention; and

Fig. 4 is a similar view of a filter fabric according to the invention.

Fig. 1 is a much enlarged fragmentary cross-section of a papermachine press fabric 10 according to the invention, to replace

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conventional press felts, extended nip press belts and similar papermachine fabrics. Fabric 10 comprises a membrane 11 of synthetic plastics material comprising a sheet formed with a myriad of apertures or holes 12 there through, thus providing a foraminous membrane. The membrane 11 is reinforced by polyamide yarns 13 extending in the machine direction of the fabric. Further yarns may extend in the cross-machine direction, but do not appear in the drawing.

The upper (paper-side) surface of the membrane 11 carries a layer 14 of polymeric particles 15, which are sintered together, being partially fused on contacting surfaces to provide a coherent structure, having a network of interstices between the particles which renders the structure porous and water permeable.

The sintered particle layer 14 in turn carries a layer or coating 16 of polymeric material which is applied over the particle layer 14 by any suitable coating technique, but may be applied by transfer from a release belt in the process described in WO 95/21285 mentioned above.

The layer 16 is microporous, and preferably reticular, to allow passage of water expressed from a paper web on layer 16 to pass through the coating layer 16 into the lower layers of the fabric.

The coating layer 16 is microporous, whilst layer 14 has voids on a submillimetre scale, and the membrane 11, has apertures 12 which measure

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a few millimetres in diameter or width. A hierarchy of void sizes is thus created leading away from the paper contacting surface of the coating layer 16, which encourages flow of water away from the paper web, but restricts and impedes return flow, so that the fabric is effective in use in a papermachine press drying stage in removing water from the paper web, and preventing rewetting of the paper.

Fig. 2 illustrates an alternative embodiment of industrial fabric according to the invention. This may be suitable for use for example as a filter fabric. The fabric 20 comprises a woven substrate 21 (shown diagrammatically by a conventionalised representation of warp and weft yarns) which is encapsulated in a sintered layer 22 formed of partially fused polymeric particles. Layer 22 carries a coating layer 23 of polymeric material which has a reticular structure, applied thereto by any suitable coating technique. The layer 23 may provide the upstream side of the filter fabric, so that the filter cake collects on the coated face of the fabric, and provides for improved release of the filter cake as compared with known woven, felted or sintered filter fabrics without a coating.

Fig. 3 is a similar cross-section of an alternative embodiment of papermachine clothing 30, for instance, and shows a woven substrate 31 encapsulated in a layer 32 of sintered partially fused polymeric particles. Layer 32 carries a coating layer 33 of reticular polymeric material. The

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composite layer is supported on a spiral link fabric 34.

In Fig. 4 a filter fabric 40 is shown comprising a woven fabric support layer 41, carrying a layer 42 of sintered or partially fused polymeric particles 43, which is covered in turn by a layer 44 comprising a textile nonwoven fabric. This is meltblown or spunbond, or thermally bonded, of fibres which are 0.1-50 dtex, and form a nonwoven with a basis weight from 10-800 g/m², of 0.1-4mm thickness.

In the case of a meltblown, fibres are from 1-5 microns in diameter and form pores less than 1 micron in size.

The nonwoven layer 44 is heat bonded to the sintered layer 42. Other means such as chemicals (e.g. solvent or adhesive) or ultrasonic welding may be used to effect this bond.

The nonwoven layer 44 is of spun polypropylene fibres, but may be of any of a range of materials including polyesters, copolyesters, polyamides, aramids, fluoropolymers, elastomers, polystyrene, or mineral fibres, examples of which are set out above.

The nonwoven layer provides a coating or layer, which, whilst it comprises a nonwoven fabric, provides a surface which is capable of being sensibly smooth to the unaided eye and touch, and is therefore suitable for use in place of the smooth polymeric coating specified in our aforementioned application, and indeed is considered to provide such a

coating.

The fabric according to Fig. 4 is described as a possibly endless filter fabric, and may be suitable for use as a flexible cloth, or a rigid seam or semi-rigid premoulded filter element, depending upon the nature of the reinforcement support 41, or the sintered layer 42. This type of structure, within the scope of the invention, may also or instead be configured as a papermachine belt, such as a dryer belt fabric, transfer belt, forming fabric, tissue making belt or the like.

Preferred sinterable materials include EVA, polyethylene, fluoropolymers (e.g. PTFE), thermoplastic elastomers, and thermoplastic polyurethane, as these can provide flexible and tough sheets of material; EVA is particularly preferred for this reason. Polyamides, polyacetals and PEEK may also be sintered. The particles may be present as fibres rather than granular particles.

The coating is an epoxy, silicone or fluoropolymer, (such as PTFE) for good abrasion resistance. These materials are also suitable for use for high temperature papermachine clothing applications, e. g: impingement dryers, condebelt dryers, press dryers, or impulse dryer machines on account of their resistance to thermal degradation and hydrolysis. The membrane is preferably a thermoplastic elastomer, e. g. thermoplastic polyurethane for good resilience and compaction resistance. Silicone may be used for higher

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temperature applications. Each coating provides a smooth coating, with an R_a value greater than or equal to 50 for the surface roughness.

The uniformity of fabrics according to the invention reduces paper sheet rewetting, provides improved sheet release control and improves the uniformity of pressure transmission to the paper sheet, which all serve to improve the uniformity and quality of the paper produced.

These embodiments are described by way of example only, and any combination of encapsulated or separate support structures with the sintered particle layer and coating layer may be provided. One or more fibrous batt layers may be provided in the structure, between other layers, or over the polymeric coating to e.g. provide mechanical cushioning of a paper web carried by the fabric.

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CLAIMS

1. An industrial fabric, at least an upper or paper-contacting layer of which includes a layer of sintered partially fused polymeric particles and/or fibres, coated on said upper paper-contacting face with a smooth polymeric coating.
2. A fabric according to claim 1, wherein said coating has a surface R_zD value equal to or greater than 50.
3. A fabric according to claim 2 wherein said layer of sintered polymeric material is carried upon a support structure comprising a foraminous membrane.
4. A fabric according to claim 3 wherein said membrane is reinforced by yarns or filaments within the structure of said membrane.
5. A fabric according to claim 3 or 4 wherein said support structure is wholly or partially encapsulated within the layer of sintered polymeric material.
6. A fabric according to claim 1 wherein said layer of sintered polymeric material is carried upon a support structure comprising a woven or nonwoven fabric, a needlefelt, or a spiral link fabric.
7. A fabric according to claim 5 wherein the sintered layer encapsulates one or more additional layers.
8. A fabric according to claim 7 wherein the, or at least one of the,

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additional layers comprises a textile layer or a layer of chopped fibres.

9. A fabric according to claim 7 wherein the, or at least one of the, additional layers comprises a membrane reinforcing layer.

10. A fabric according to any preceding claim wherein the polymeric coating is applied by transfer.

11. A fabric according to any preceding claim wherein the polymeric coating is porous.

12. A fabric according to claim 11 wherein the polymeric coating is reticular.

13. A fabric according to claim 1 comprising a porous polymer layer over a layer of sintered polymeric particles carried in turn upon a foraminous membrane.

14. A fabric according to claim 11 wherein the coating layer has been rendered porous by incorporation of a blowing agent which forms bubbles in the layer which are burst on application of the layer to the sintered layer.

15. A fabric according to claim 1 wherein the polymeric coating comprises a layer of a nonwoven fabric.

16. A fabric according to claim 15 wherein said nonwoven fabric is any one of a meltblown, a spunbond, a meltblown/spunbond laminate or a thermally bonded nonwoven.

17. A fabric according to claim 15 wherein the nonwoven fabric is

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bonded to a layer of sintered particles.

18. A fabric according to claim 15 wherein the nonwoven fabric is composed of fibres of a material selected from polyolefins, polyester, copolyesters, polyamides, aramids, fluoropolymers, elastomers, PPS; PPO; PBO; glass; ceramics, basalt or carbon, or a blend of fibres of two or more such materials.

19. A fabric according to claim 15 wherein the fibres are 0.1-50 dtex and from a nonwoven with a basis weight of 10-800 g/m², and thickness of 0.1-4.0mm.

20. Papermachine clothing comprising a fabric as claimed in any preceding claim.

21. Industrial belting comprising a fabric as claimed in any of claims 1 to 19.

22. An industrial filter medium comprising a fabric as claimed in any of claims 1 to 19.

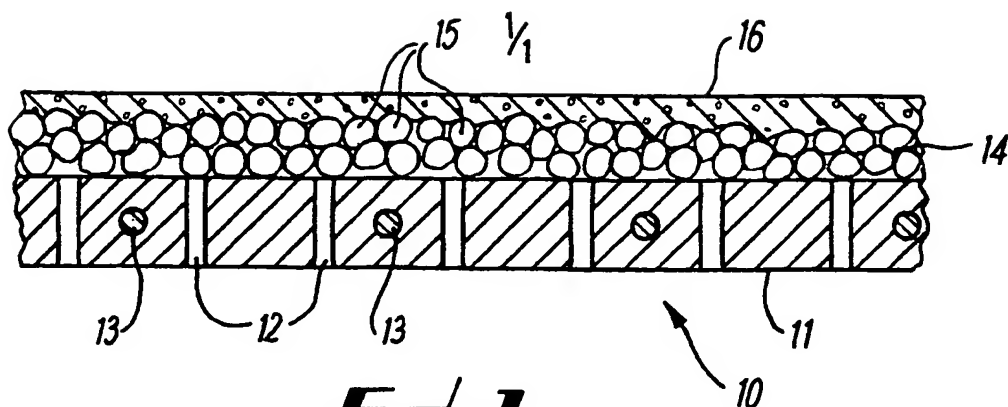


FIG. 1

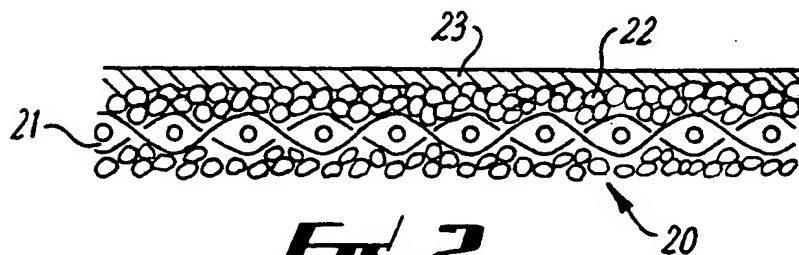


FIG. 2

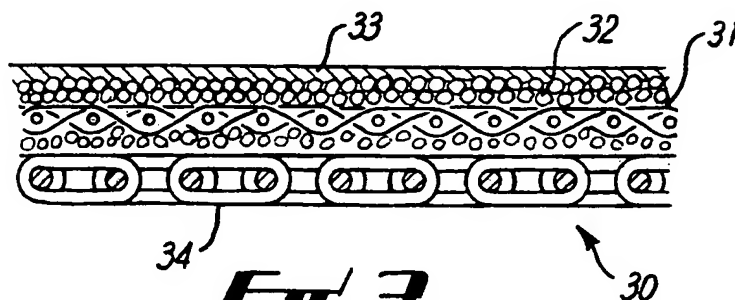


FIG. 3

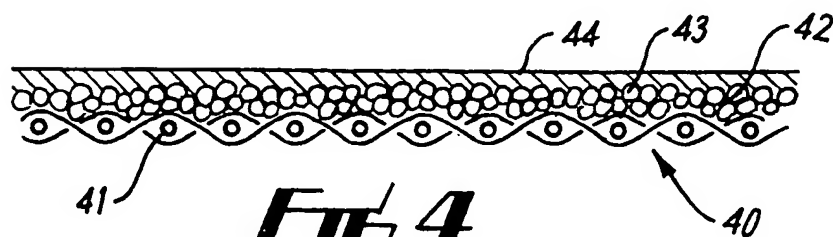


FIG. 4

INTERNATIONAL SEARCH REPORT

International Application No

PCT/GB 98/02832

A. CLASSIFICATION OF SUBJECT MATTER

IPC 6 D06N7/00 D21F7/08 B01D39/08 B01D39/16

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 6 D21F B01D D06N

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

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☒ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

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Date of the actual completion of the international search

14 January 1999

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27/01/1999

Name and mailing address of the ISA

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NL - 2280 HV Rijswijk
Tel. (+31-70) 340-2040, Tx. 31 651 epo nl,
Fax: (+31-70) 340-3018

Authorized officer

Pamies Olle, S

INTERNATIONAL SEARCH REPORT

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C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

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International Application No

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